

ORAL

Technical Session 4

Heat stress, health and welfare: genetics and management

Novel approaches to breeding for climate-smart dairy cattle

Dodd Gabriella^[1], Baes Christine^[1], Schenkel Flavio^[1], Machefert Coralie^[1], Ampofo Issabelle^[1], Amini Baran^[1], Storing Victoria^[1], Fleming Allison^[2], Lee Kristin^[2], Malchiodi Francesca^[3], Richardson Caeli^[4], Miglior Filippo^[5]

[1] Centre for Genetic Improvement of Livestock, Department of Animal Biosciences, University of Guelph, [2] Lactanet, [3] Semex, Centre for Genetic Improvement of Livestock, Department of Animal Biosciences, University of Guelph, [4] AbacusBio, [5] Lactanet, Centre for Genetic Improvement of Livestock, Department of Animal Biosciences, University of Guelph

Climate change remains a significant challenge for dairy production, increasing heat stress on cows and adding pressure to reduce environmental impacts like greenhouse gas emissions. Selective breeding offers a long-term strategy to improve both environmental sustainability and resilience, alongside existing economic goals. However, the relationships among traits related to productivity, heat tolerance, and methane emissions are not fully understood. This project evaluates how breeding for improved heat tolerance influences profitability, animal health, production efficiency, and environmental sustainability. Specifically, it 1) quantifies the impact of heat stress on production, fertility, health, and emissions and 2) investigates the genetic relationships of methane emissions, body maintenance requirements, and feed efficiency, with the ability of cows to maintain performance under heat stress.

Preliminary findings indicate that fat yield is the trait most sensitive to heat stress effects while methane production is only impacted under severe pressure. Additionally, results indicate that higher milk production under normal conditions may be associated with reduced resilience to heat stress, highlighting a potential trade-off between productivity and robustness. Importantly, selection for reduced methane emissions appears unlikely to negatively affect heat tolerance. These results emphasize the importance of balanced breeding strategies that simultaneously improve productivity, environmental sustainability, and resilience.

The culmination of this project will inform the development of breeding programs and indexes to breed climate-smart dairy capable of sustaining profitability while adapting to a changing climate.